514 Rec'd PCT/PTO 06 MAR 2000

FORM PTO-1390 (Modified) (REV 11-98) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: **NSG-180US**

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR: **09/486973**

INTERNATIONAL APPLICATION NO	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/JP99/03630	**6 JULY 1999 (06.07.99)**	**7 JULY 1998 (07.07.98)**

TITLE OF INVENTION

RAW MATERIAL COMPOSITION FOR SODA-LIME GLASS

APPLICANT(S) FOR DO/EO/US

Chihiro SAKAI; Yoshikazu Toshikiyo

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau)
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired
   d. ☒ have not been made and will not be made
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☒ Certificate of Mailing by Express Mail
20. ☐ Other items or information:

1. Request

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U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
09/486973	PCT/JP99/03630	NSG-180US

21. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS	PTO USE ONLY
☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1 445(a)(2) paid to USPTO and International Search Report not prepared by the EPO or JPO	$970.00		
☒ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but Internation Search Report prepared by the EPO or JPO	$840.00		
☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	$690.00		
☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)	$670.00		
☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4)	$96.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =		$840.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).		$0.00	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	8 - 20 =	0	x $18.00	$0.00	
Independent claims	4 - 3 =	1	x $78 00	$78.00	
Multiple Dependent Claims (**check if applicable**)			☐	$0.00	
TOTAL OF ABOVE CALCULATIONS =				$918.00	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (**check if applicable**). ☐				$0.00	
SUBTOTAL =				$918.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +				$0.00	
TOTAL NATIONAL FEE =				$918.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28. 3.31) (**check if applicable**). ☒				$40.00	
TOTAL FEES ENCLOSED =				$958.00	
				Amount to be: refunded	$
				charged	$

☒ A check in the amount of **$958.00** to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. in the amount of to cover the above fees
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **18-0350** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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31,549
REGISTRATION NUMBER

March 6, 2000
DATE

09/486973
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Description

Raw Material Composition for Soda-Lime Glass

Technical Field

The present invention relates to a raw material composition for soda-lime glass, and more particularly to a raw material composition for soda-lime glass capable of effectively suppressing formation of nickel sulfide (NiS) in a glass base in the course of melting of the glass raw material, to thereby produce a glass product of high quality.

Background Art

In a conventional method for producing soda-lime glass, in a step for melting glass raw material at a temperature as high as near 1,500°C in a melting furnace, a nickel (Ni) component contained in stainless steel used for the interior of the melting furnace and Ni-containing metal particles (e.g., stainless steel particles) present in glass raw material as an impurity may be mixed into molten glass, and the Ni component may react with a sulfur (S) component in mirabilite (Na_2SO_4) serving as a glass raw material. As a result, nickel sulfide (NiS) may be present as a fine impurity in a melt-molded glass substrate. The incidence of an NiS impurity in a defective glass product is very low; i.e., the number of impurities is about one in some 10 tons (t) of glass products. In addition, the impurity has a

spherical particle and the particle size is as small as 0.3 mm or less, and thus detection of the impurity in a production line is very difficult.

In order to process a substrate formed of such soda-lime glass into glass for a building or a toughened glass plate for an automobile, the substrate is heated to the softening point (near 600°C) and quenched, to thereby produce compressive stress in the surface layers of the glass plate.

When nickel sulfide (NiS) is contained as an impurity in toughened glass which is heated and cooled to ambient temperature in a toughening step, α-phase NiS, which is stable at about 350°C or higher, is present in an unstable state. Since α-Phase NiS is unstable at ambient temperature, with passage of time it is transformed into β-phase NiS, which is stable at ambient temperature. The volume of NiS increases concomitant with phase transformation. A toughened glass plate contains a tensile stress layer having a thickness which is about 2/3 the overall thickness of the plate, and thus cracks grow rapidly due to an increase in NiS volume in the tensile stress layer, to thereby cause spontaneous breakage of the glass plate.

In order to prevent such spontaneous breakage of toughened glass, a method for removing a defective product containing an NiS impurity is known (which method is called soaking treatment). In the method, toughened glass which is heated and cooled to ambient temperature in a toughening step is placed in a firing furnace (a soaking furnace) and re-

heated and maintained therein for a predetermined period of time, and any unstable α-phase NiS contained in the toughened glass is transformed into β-phase NiS, which is stable at about 300°C or less, to thereby increase the volume of NiS and compulsorily break the defective glass.

However, in such steps mainly comprising thermal treatment, a long period time and a great amount of thermal energy are used in order to raise temperature, and thus production cost may increase. In addition, such steps raise a serious problem against reduction in production time and enhancement of productivity.

Disclosure of the Invention

In order to solve the aforementioned problems involved in conventional techniques, an object of the present invention is to provide a raw material composition for soda-lime glass capable of effectively suppressing formation of nickel sulfide (NiS) in the course of melting of the glass raw material.

Another object of the present invention is to provide a raw material composition of soda-lime glass capable of effectively suppressing formation of NiS in the course of melting of the glass raw material when the material contains, as a coloring component, ferric oxide (Fe_2O_3), selenium (Se), cerium (Ce), or other metallic materials in a very small amount.

A nickel sulfide (NiS) impurity in soda-lime glass is

formed in a high-temperature vitrification step in which metallic particles containing Ni and an Ni component contained in stainless steel used for a melting furnace, which are mixed into glass raw material, react with a sulfur (S) component in Na_2SO_4 serving as a glass raw material. When an additive including an oxide, chloride, sulfate, or a nitrate of a metal is added in a very small amount and in advance to glass raw material, formation of NiS by reaction between Ni and S in the course of melting may be suppressed or completely eliminated, for the reasons described below. When a metal oxide is added in a very small amount to glass raw material, NiS reacts with other metals to form a eutectic compound, and the decomposition temperature decreases. When a chloride, sulfate, or a nitrate of a metal is added in a very small amount to glass raw material, oxidation is promoted, and thus formation of sulfides of Ni becomes difficult. As a result, formation of NiS may be suppressed.

In one embodiment of the present invention, the raw material composition is characterized by comprising a mirabilite(Na_2SO_4)-containing glass raw material to which an additive containing an oxide, a chloride, a sulfate, or a nitrate of a metal is incorporated.

In another embodiment of the present invention, the raw material composition is characterized by comprising a glass raw material including mirabilite (Na_2SO_4) and, as a coloring component, at least one species selected from the group consisting of ferric oxide (Fe_2O_3), selenium (Se), cerium

(Ce), and other metallic materials, wherein the glass raw material further include an additive containing an oxide, a chloride, a sulfate, or a nitrate of a metal.

The aforementioned metal is at least one species selected from the group consisting of tin (Sn), iron (Fe), cobalt (Co), manganese (Mn), lead (Pb), lithium (Li), potassium (K), and sodium (Na). The percentage by weight of the aforementioned additives may be 0.15% or less on the basis of the total weight of the aforementioned glass raw material.

The incidence of an NiS impurity in a defective glass product is about one in some 10 tons (t) of glass products in a float-type melting furnace in practice, and the amount of Ni component contained in glass products is very low; i.e., 10 ppm (0.001 wt.%) or less. Therefore, only a ultra-very small amount of a metal oxide or the like is required to be added to glass raw material for the present invention to exhibit sufficient effects on reduction or complete elimination of formation of nickel sulfide (NiS).

Best Mode for Carrying Out the Invention

(Example 1)

There was performed a test simulating the case in which nickel (Ni) metal reacts with a sulfur (S) component to thereby form nickel sulfide (NiS) in the course of melting of glass raw material in a float-type melting furnace in practice.

The respective raw materials shown in Table 1 were mixed, to thereby prepare a glass raw material (200 g). Subsequently, powder of metallic Ni (particle size: 149 μm) was added to the glass raw material in an amount by weight of 0.07% on the basis of the total weight of the material, to thereby prepare Ni-powder-containing glass raw material 1.

Table 1

Raw material	Amount used (g)
Silica sand	92.0
Soda ash	26.5
Dolomite	23.6
Limestone	5.8
Mirabilite	2.0
Carbon	0.1
Cullet	50.0
Total	200.0

Ni-powder-containing glass raw material 1 was placed in an alumina crucible (volume: 250 cc), and the crucible was pre-heated at 600°C for 30 minutes and placed in an electric furnace maintained at 1,370°C. The temperature was raised to 1,400°C over 10 minutes. The crucible was maintained in the furnace at the temperature for 2.2 hours and removed from the furnace. The thus-heated glass material was cast, to thereby prepare sample glass 1.

Table 2 shows the amount of added Ni powder (wt.%), the maximum particle size of NiS particles (μm), and the number of NiS particles per glass weight (number/g) in sample glass 1. The number of NiS particles was determined by observation under a stereoscopic microscope.

Table 2

	Amount of addition (wt.%)	Maximum particle size (μm)	Number (number/g)
Sample 1	0.0700	120	1.13

There were prepared five sets of glass raw material having the same composition as glass raw material 1 used for preparing sample glass 1 in which NiS was formed.

Tin oxide (SnO_2), an oxide of tin (Sn), was added to one of the above five sets of glass raw material, to thereby prepare glass raw material containing Ni metal powder and SnO_2; i.e., glass raw material 2.

In the same manner, iron oxide (Fe_2O_3), an oxide of iron (Fe), was added to one of the above five sets of glass raw material, to thereby prepare glass raw material containing Ni metal powder and Fe_2O_3; i.e., glass raw material 3.

In the same manner, cobalt oxide (CoO), an oxide of cobalt (Co), was added to one of the above five sets of glass raw material, to thereby prepare glass raw material containing Ni metal powder and CoO; i.e., glass raw material 4.

In the same manner, manganese oxide (MnO), an oxide of manganese (Mn), was added to one of the above five sets of glass raw material, to thereby prepare glass raw material containing Ni metal powder and MnO; i.e., glass raw material 5.

In the same manner, lead oxide (PbO), an oxide of lead (Pb), was added to one of the above five sets of glass raw

material, to thereby prepare glass raw material containing Ni metal powder and PbO; i.e., glass raw material 6.

Each of these glass raw materials 2 to 6 was placed in an alumina crucible, and the crucible was placed in an electric furnace, heated, and maintained in the furnace. Thereafter, the crucible was removed from the furnace. The thus-heated glass materials were cast, to thereby obtain sample glasses 2 to 6. Table 3 shows the amount of added additives (wt.%), the maximum particle size of NiS particles (μm), and the number of NiS particles per glass weight (number/g) in the respective sample glasses.

Table 3

	Additive	Amount of addition (wt.%)	Maximum particle size (μm)	Number (number/g)
Sample 2	SnO_2	0.1500	200	0.52
Sample 3	Fe_2O_3	0.1500	120	0.50
Sample 4	CoO	0.1500	–	0.00
Sample 5	MnO	0.1500	200	0.47
Sample 6	PbO	0.1500	200	0.67

As is apparent from Table 3, when a metal oxide is added in a very small amount to the glass raw material, formation of NiS in a glass product is effectively suppressed.

(Example 2)

There were prepared three sets of glass raw material having the same composition as glass raw material 1 used for preparing sample glass 1 in which NiS was formed.

Subsequently, sodium nitrate ($NaNO_3$), a nitrate of

sodium (Na), was added to one of the above three sets of glass raw material, in an amount of 50% on the basis of the total amount of $NaNO_3$ and mirabilite (Na_2SO_4) in the glass raw material, to thereby prepare glass raw material containing Ni metal powder and $NaNO_3$; i.e., glass raw material 7.

In the same manner, potassium nitrate (KNO_3), a nitrate of potassium (K), was added to one of the above three sets of glass raw material, in an amount of 50% on the basis of the total amount of KNO_3 and mirabilite (Na_2SO_4) in the glass raw material, to thereby prepare glass raw material containing Ni metal powder and KNO_3; i.e., glass raw material 8.

In the same manner, lithium nitrate ($LiNO_3$), a nitrate of lithium (Li), was added to one of the above three sets of glass raw material, in an amount of 50% on the basis of the total amount of $LiNO_3$ and mirabilite (Na_2SO_4) in the glass raw material, to thereby prepare glass raw material containing Ni metal powder and $LiNO_3$; i.e., glass raw material 9.

Each of these glass raw materials 7 to 9 was placed in an alumina crucible, and the crucible was placed in an electric furnace, heated, and maintained in the furnace. Thereafter, the crucible was removed from the furnace. The thus-heated glass materials were cast, to thereby obtain sample glasses 7 to 9. Table 4 shows the addition condition of metal nitrates, the maximum particle size of NiS particles (μm), and the number of NiS particles per glass weight (number/g) in the respective sample glasses.

Table 4

	Addition condition	Maximum particle size (μm)	Number (number/g)
Sample 7	$NaNO_3:Na_2SO_4$ = 1:1	300	0.25
Sample 8	$KNO_3:Na_2SO_4$ = 1:1	400	0.39
Sample 9	$LiNO_3:Na_2SO_4$ = 1:1	300	0.20

As is apparent from Table 4, when a metal nitrate is added in a very small amount to the glass raw material, formation of NiS in a glass product is effectively suppressed.

(Example 3)

There were prepared seven sets of glass raw material having the same composition as glass raw material 1 used for producing sample glass 1 in which NiS was formed.

Iron (Fe) powder was added to one of the above seven sets of glass raw material, to thereby prepare glass raw material containing Ni metal powder and Fe; i.e., glass raw material 10.

In the same manner, iron oxide (Fe_2O_3), an oxide of Fe, was added to one of the above seven sets of glass raw material, to thereby prepare glass raw material containing Ni metal powder and Fe_2O_3; i.e., glass raw material 11.

In the same manner, iron chloride hydrate ($FeCl_3 \cdot 6H_2O$), a chloride of Fe, was added to one of the above seven sets of glass raw material, to thereby prepare glass raw material containing Ni metal powder and $FeCl_3 \cdot 6H_2O$; i.e., glass raw material 12.

In the same manner, iron sulfate hydrate ($FeSO_4 \cdot 7H_2O$), a sulfate of Fe, was added to one of the above seven sets of

glass raw material, to thereby prepare glass raw material containing Ni metal powder and $FeSO_4 \cdot 7H_2O$; i.e., glass raw material 13.

In the same manner, iron nitrate hydrate ($Fe(NO_3)_3 \cdot 9H_2O$), a nitrate of Fe, was added in different amounts (wt.%) to three of the above seven sets of glass raw material, to thereby prepare glass raw materials containing Ni metal powder and $Fe(NO_3)_3 \cdot 9H_2O$; i.e., glass raw materials 14 to 16.

Each of these glass raw materials 10 to 16 was placed in an alumina crucible, and the crucible was placed in an electric furnace, heated, and maintained in the furnace. Thereafter, the crucible was removed from the furnace. The thus-heated glass materials were cast, to thereby obtain sample glasses 10 to 16.

Table 5 shows the additives, the amount of added additives (wt.%), the maximum particle size of NiS particles (μm), and the number of NiS particles per glass weight (number/g) in the respective sample glasses.

Table 5

	Additive	Amount of addition (wt.%)	Maximum particle size (μm)	Number (number/g)
Sample 10	Fe	0.1500	300	1.70
Sample 11	Fe_2O_3	0.1500	120	0.50
Sample 12	$FeCl_3 \cdot 6H_2O$	0.1500	300	0.80
Sample 13	$FeSO_4 \cdot 7H_2O$	0.1500	120	0.73
Sample 14	$Fe(NO_3)_3 \cdot 9H_2O$	0.1500	50	0.01
Sample 15	$Fe(NO_3)_3 \cdot 9H_2O$	0.1000	500	0.66
Sample 16	$Fe(NO_3)_3 \cdot 9H_2O$	0.0750	137	1.03

As is apparent from Table 5, when an oxide, chloride,

sulfate, or nitrate of Fe is added in a very small amount to the glass raw material, formation of NiS in a glass product is effectively suppressed.

In glass products actually produced in practice, the Ni content of glass is much lower than the value shown in Table 2; i.e., the content is 10 ppm (0.001 wt.%) or less as described above, and therefore, the amount of the additive added to glass raw material is small. As is apparent from the results of the examples, even when the amount of additive is 0.01 wt.% or less on the basis of the weight of glass raw material, sufficient effects may be obtained.

The above-described examples are applicable to glass raw material having a composition including a coloring component; for example, ferric oxide (Fe_2O_3), selenium (Se), cerium (Ce), or other metallic materials in a very small amount.

Industrial Applicability

In the present invention, glass raw material comprises an additive containing an oxide, a chloride, a sulfate, or a nitrate of a metal in a very small amount, and thus formation of nickel sulfide (NiS) by reaction between nickel (Ni) and a sulfur (S) component in molten glass can be suppressed. In addition, the amount of NiS in a glass product can be greatly reduced.

Even when the aforementioned additives are added in very small amounts to a glass plate, physical properties of

glass, including color, viscosity, and expansion coefficient, do not change, and the glass plate can maintain its original quality, which is very advantageous in practice.

As described above, in the present invention, a glass product containing substantially no NiS can be produced. In practice, even when additives are added in amounts of 0.01 wt.% or less to glass raw material, nickel sulfide (NiS) can be sufficiently reduced or eliminated. In addition, the production process for toughened glass does not require a soaking process, and thus production cost for the glass can be reduced.

Furthermore, soda-lime glass can be produced through a method similar to a conventionally-employed one, and thus conventional production equipment can be used as is, and therefore it is not necessary to modify the equipment or to build additional equipment. Therefore, quality of toughened glass can be enhanced and equipment operating cost can be reduced.

Claims

1. A raw material composition for soda-lime glass, comprising a mirabilite(Na_2SO_4)-containing glass raw material to which an additive containing an oxide, a chloride, a sulfate, or a nitrate of a metal is incorporated.

2. A raw material composition for soda-lime glass according to claim 1, wherein the metal is at least one species selected from the group consisting of tin (Sn), iron (Fe), cobalt (Co), manganese (Mn), lead (Pb), lithium (Li), potassium (K), and sodium (Na).

3. A raw material composition for soda-lime glass according to claim 2, wherein the percentage by weight of the additive is 0.15% or less on the basis of the total weight of the glass raw material.

4. A raw material composition for soda-lime glass, comprising a mirabilite(Na_2SO_4)-containing glass raw material to which an additive selected from the group consisting of sodium nitrate ($NaNO_3$), potassium nitrate (KNO_3), and lithium nitrate ($LiNO_3$) is incorporated, wherein about 50% of the amount of mirabilite (Na_2SO_4) contained in the glass raw material is replaced by the additive.

5. A raw material composition for soda-lime glass, comprising a glass raw material including mirabilite (Na_2SO_4) and, as a coloring component, at least one species selected from the group consisting of ferric oxide (Fe_2O_3), selenium (Se), cerium (Ce), and other metallic materials, wherein the glass raw material further include an additive containing an

oxide, a chloride, a sulfate, or a nitrate of a metal.

6. A raw material composition for soda-lime glass according to claim 5, wherein the metal is at least one species selected from the group consisting of tin (Sn), iron (Fe), cobalt (Co), manganese (Mn), lead (Pb), lithium (Li), potassium (K), and sodium (Na).

7. A raw material composition for soda-lime glass according to claim 6, wherein the percentage by weight of the additive is 0.15% or less on the basis of the total weight of the glass raw material.

8. A raw material composition for soda-lime glass, comprising a glass raw material including mirabilite (Na_2SO_4) and, as a coloring component, at least one species selected from the group consisting of ferric oxide (Fe_2O_3), selenium (Se), cerium (Ce), and other metallic materials, wherein the glass raw material further include an additive selected from the group consisting of sodium nitrate ($NaNO_3$), potassium nitrate (KNO_3), and lithium nitrate ($LiNO_3$) is incorporated, wherein about 50% of the amount of mirabilite (Na_2SO_4) contained in the glass raw material is replaced by the additive.

Abstract

The present invention provides a raw material composition for soda-lime glass capable of effectively suppressing formation of nickel sulfide (NiS) in the course of melting of the glass raw material. A nickel sulfide (NiS) impurity present in soda-lime glass is formed in a high-temperature vitrification step in which metal particles containing Ni and an Ni component of stainless steel used for the interior of a melting furnace, which are mixed into glass raw material, react at high temperature with a sulfur (S) component in Na_2SO_4 serving as a glass raw material. However, when an additive containing an oxide, a chloride, a sulfate, or a nitrate of a metal is added in a very small amount and in advance to glass raw material, formation of NiS by the reaction between Ni and S in the course of melting can be suppressed or completely eliminated.

Declaration and Power of Attorney For Patent Application
English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

RAW MATERIAL COMPOSITION FOR SODA-LIME GLASS

the specification of which is attached hereto unless the following box is checked:

☐ was filed on 06/07/1999 as United States Application Number or PCT International Application Number PCT/JP99/03630 and was amended on ____________ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Not Claimed
10-191,221	JAPAN	07/07/1998	
(Number)	(Country)	(Day/Month/Year Filed)	☐
(Number)	(Country)	(Day/Month/Year Filed)	☐

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

(Application Number)	(Filing Date)
(Application Number)	(Filing Date)

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Number) (Filing Date) (Status - patented, pending, abandoned)

(Application Number) (Filing Date) (Status - patented, pending, abandoned)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office
14 connected therewith:

Paul F. Prestia	Reg.No. 23,031	Lawrence E. Ashery	Reg.No. 34,515	Louis W. Beardell	Reg.No. P40,506
Allan Ratner	Reg.No. 19,717	Christopher R. Lewis	Reg.No. 36,201	Ian M. Hughes	Reg.No. P41,083
Andrew L. Ney	Reg.No. 20,300	Steven E. Koffs	Reg.No. 37,163	Basil S. Krikelis	Reg.No. P41,129
Kenneth N. Nigon	Reg.No. 31,549	Anthony L. DiBartolomeo	Reg.No. 37,308		
Kevin R. Casey	Reg.No. 32,117	Allan M. Wheatcraft	Reg.No. 36,307		
Guy T. Donatiello	Reg.No. 33,167	Anthony Grillo	Reg.No. 36,535		
Benjamin E. Leace	Reg.No. 33,412	Leon Nigohosian, Jr.	Reg.No. 39,791		
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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